Comments on **"Preliminary Estimates of Loads to the Refuge After STA-1E is in Operation, DRAFT – May 12, 2005"** by Dr. Gary Goforth

The comments compiled here are from individual DOI technical staff and consultants. They are not comprehensive and have not undergone extensive internal review. Although we agree with many parts of the document, our failure to comment on a specific item does not imply concurrence. Our purpose is to help work toward a better understanding of the near-future management challenges, future remedies, current and future opportunities, risks to water quality, and quantitative expectation of restoration of Refuge lands.

This document by Dr. Goforth provides a useful focus for discussions of impacts of future construction and management on loads of TP discharged to the Refuge. It compiles relevant information, and summarizes projections. Projection of future loads is a valuable evaluation tool, and we appreciate SFWMD and Dr. Goforth's effort to initiate this analysis. This effort also helps us define goals and requirements. Similar analyses will be helpful in development and adaptive revision of the STA-1E operations manual.

The title wording "*...after STA-1E is in operation*" is misleading. The projections provided here are dependent on all of the assumed changes enumerated in the report. It is therefore suggested that the title be changed to "*Preliminary estimates of future loads to the Refuge.*"

Indeed, STA-1E operation is anticipated to bring in significant sources of new water, likely over 100,000 acre-feet (Fig. 1) with its associated load to the STAs as well as to the Refuge (Figs. 2, 3). Thus, under some reasonable scenarios, STA-1E operations present an added challenge for the treatment systems at a time when we are searching for ways to improve Refuge water quality. The Refuge does support the STA-1E project. STA-1E will bring added water volume to the EPA, and will give added flexibility to managers. However, in our opinion, its construction delay is not the chief cause of excessive TP loading to the Refuge, and its operation will not solve the water quality difficulties facing the Refuge.

Focus of the TOC is most productively placed on current & potential future problems, not historical ones. Interim strategies must be developed that achieve design loads for each STA without bypass.

The Goforth report presents optimistic scenarios in its projection of future treatment efficiency. This is particularly true if we consider startup and stabilization periods when, especially during startup, draft permitted concentrations may be well in excess of 100 ppb. There is considerable uncertainty concerning the level of treatment that will be achieved. There is additionally a considerable uncertainty in the volume of flow that will be treated caused by climatic variability and present uncertainty about flow management. As an example of an alternative, but quite plausible, scenario set, consider the following set of six scenarios:

Existing*	**STA1W design flow + design 1W diversion to STA-1E**
1*	**STA-1E on-line, 50 ug/L; no Acme diversion**
2*	**STA-1E on-line, 50 ug/L; with acme diversion**
3*	**STA-1E on-line; 50 ug/L; Acme diversion; C-51W to tide**
4*	**STA-1E on-line; 50 ug/L; L-8 diverted north; S-5A diverted west**
5*	**STA-1E on-line; 50 ug/L; all L-8 captured by STA-1E**

These alternative scenarios are based on the assumption that treatment volumes are restricted to 180, and 165 thousand acre-feet for STA-1W and STA-1E respectively.[1] For the "Existing*" scenario, it is additionally assumed that STA-1W flow is increased by 20 thousand acre-feet to account for net flow that under the STA design would have been transferred to STA-1E from STA-1W. Consistent with the state's draft definition of an STA TBEL, it is additionally assumed that treatment is only able to achieve 50 ppb TP concentration as a long-term average at these design flows. This set of scenarios then leads to alternative projections (Fig. 4 and 5). Even with limited treatment volumes, loads discharged to the Refuge may not be significantly reduced in the future without additional actions.

Specific Comments

Numbering of these comments is provided for convenience of reference and do not imply any prioritization.

1) p. 1, second set of numbers, #1 "commencement of flow-through operation of STA-1E": This is the subject of current technical discussion and therefore it is not appropriate to automatically assume that this action will occur and reduce phosphorus loads to the Refuge. Therefore, this item is either not appropriate here, or should be more fully discussed with caveats, citations, timetables, and potential roadblocks to completing these changes.

2) p. 1, second set of numbers, #7 "potential revisions to the WCA-1 regulation schedule": Revisions to the regulation schedule will be explored for many reasons, including issues related to water quality. Therefore, it is unclear whether/ to what extent changes to the regulation schedule will aid in load reduction to the refuge.

[1] Merriam, C. (2005). "Letter to Dennis R. Duke, U. S. Army Corps of Engineers, Jacksonville District, Subject: L8 Basin - Interim operations of STA-1E and C-51 Canal." SFWMD, West Palm Beach, FL.

3) 2.1 Commencement of flow-through, p. 2, 1st para after number list: An additional sentence needs to be added to appropriately put this para in context: "However, it should be noted that STA-1E is the only STA in the ECP to treat new water."

4) p. 3, Indirect Benefits: This section fails to capture the aspect that 100,000 acre-feet of water going through STA-1E is "new" water going to the Refuge. The reduction in loading to the Refuge from easing STA-1Ws burden (design of 20,000 acre-feet/year) does not reasonably offset the loading associated with this new water.

5) 2.2 Completion of enhancements to STA-1W: This text does not capture the full spectrum. For one, there needs to be mention that activities related to enhancements of STA-1W have contributed to the causation of historic bypass events (these have already this year).

6) 2.4 Diversion of Acme Basin B runoff: The text here does not capture the issue appropriately. Suggested text to the replace the second sentence may get us closer to an appropriate representation of the topic: "The CERP Acme Basin B project currently envisions diverting this water and load to STA-1E (prior to September 2007) for treatment before discharge to the Refuge. Therefore, there will be load reductions to the Refuge from Acme Basin B's contribution." Note: there also needs to be text in this section that recognizes that the addition of this hydraulic and mass load to STA-1E puzzle may work against the intended design of STA-1E to maximize performance and put as small a new load (coming from 100,000 acre-ft of new water) into the Refuge as possible.

7) 2.6 Diversion of the L-8 basin: Second sentence to be deleted, as it doesn't contribute to our understanding of loading to the Refuge. 4th sentence: "this runoff will be sent to STA-1E for treatment, which will theoretically improve the performance of STA-1W, thereby ...". Also, as with the section on Acme B, there needs to be text in this section that recognizes that the addition of this hydraulic and mass load to STA-1E may work against the intended design of STA-1E to maximize performance and put as small a new load (coming from 100,000 acre-ft of new water) into the Refuge as possible.

8) 2.7 Potential revision to the WCA-1 regulation schedule: Last sentence needs to be revised - see comment #2 above.

9) It would be valuable to evaluate many additional scenarios, including those outlined in the table below:

Expanded List of Scenarios	
* Historical	less relevant to solving current problem
2001-2004 including lake regulatory releases	condition during most exceedances
* 2001-2004 excluding lake releases	recent improvements
With STA1E & Other Planned Changes except ACME	with alternative discharges to tide
* Full diversion of L8 & C51W to STA1E	none
* Partial diversion to STA1E (State's plan)	some (= historical L8)
No change in flow to tide; STA loads at design levels	most (=historical L8 + C51W)
With STA1E + ACME diversion	same as above
same as above....	
Other Long-term Options	
* L8 Diversion	getting back to the original plan...
Diversion west to expanded STA's	
Enhanced BMP's	
Expanded STA's	
Potential Effect of PSTA Experiment on STA1E Performance	
Equal flow distribution across STA1E	
Cells 1 & 2 offline	

* = Already wholly or partially reflected in document

10) It would also be valuable to evaluate additional performance measures for each scenario including:

- Expanded List of Performance Measures for Each Scenario
- Refuge Inflow Loads (Treated & Untreated)*
- STA inflow Loads vs. Design Loads
- STA Outflow Concentrations vs. 50 ppb & Long-term Plan Forecasts
- Refuge Inflow Concentrations
- Refuge Inflow Volumes (meet water supply needs?)
- Discharge to Tide (tradeoffs with flood control, estuary objectives?)
- Near field Impacts of STA1E discharge (peak & average, flow & conc)

11) There is a need to refine technical assumptions and modeling.

- Use 1994-2004 base loads for all sources (except STA1W bypass from 1999-2004) from B&M 2005[2]
- Use K/C* model with 6 stirred tanks (not plug flow model), consistent with B&M 2005
- Show projections for range of K values to reflect uncertainty, say 18 to 30 m/yr, based upon data
- Consider using conservative assumptions to reflect uncertainty
- Refine forecasts using DMSTA2 instead of steady-state design model

12) In the operation of STA-1E there is an added objective of not creating additional impacted fringe marsh. A monitoring/operation strategy to address near-field impacts of STA1E is needed. Constraints beyond simple loading will be needed. Further discussion and adaptive operations are essential. We concur with the suggestion (page 9) that transient modeling is needed.

[2] Burns & McDonnell. (2005). "Everglades Protection Area Tributary Basins Supplemental Analysis." prepared by Galen E. Miller, PE, for the Everglades Agricultural Area Environmental Protection District.

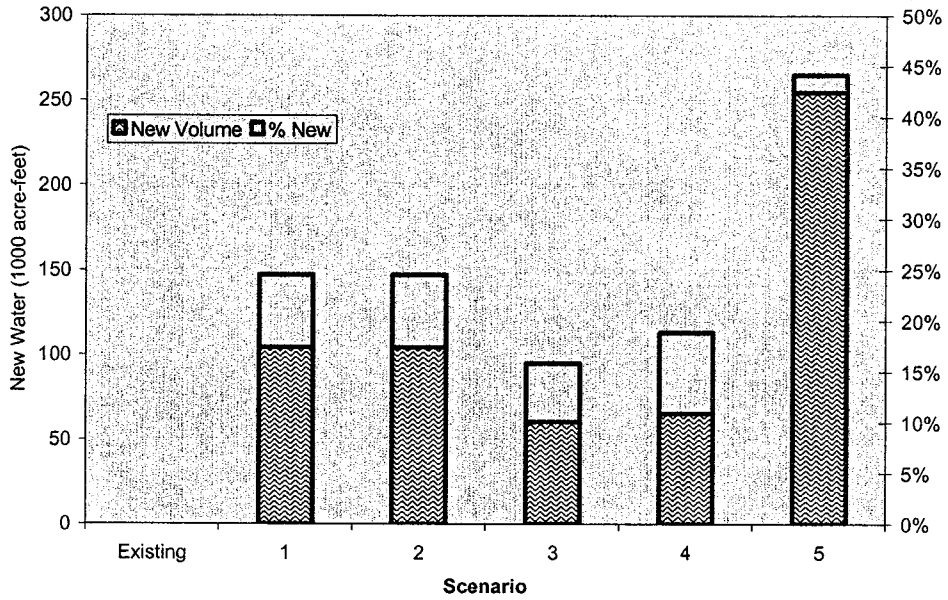

Figure 1. Volume of water not previously entering the Refuge under the "Existing" scenario, and percent of total inflow that is new. The new water sources are the L-8 and C-51W Basins. Percent new is the percent of total inflow volume.

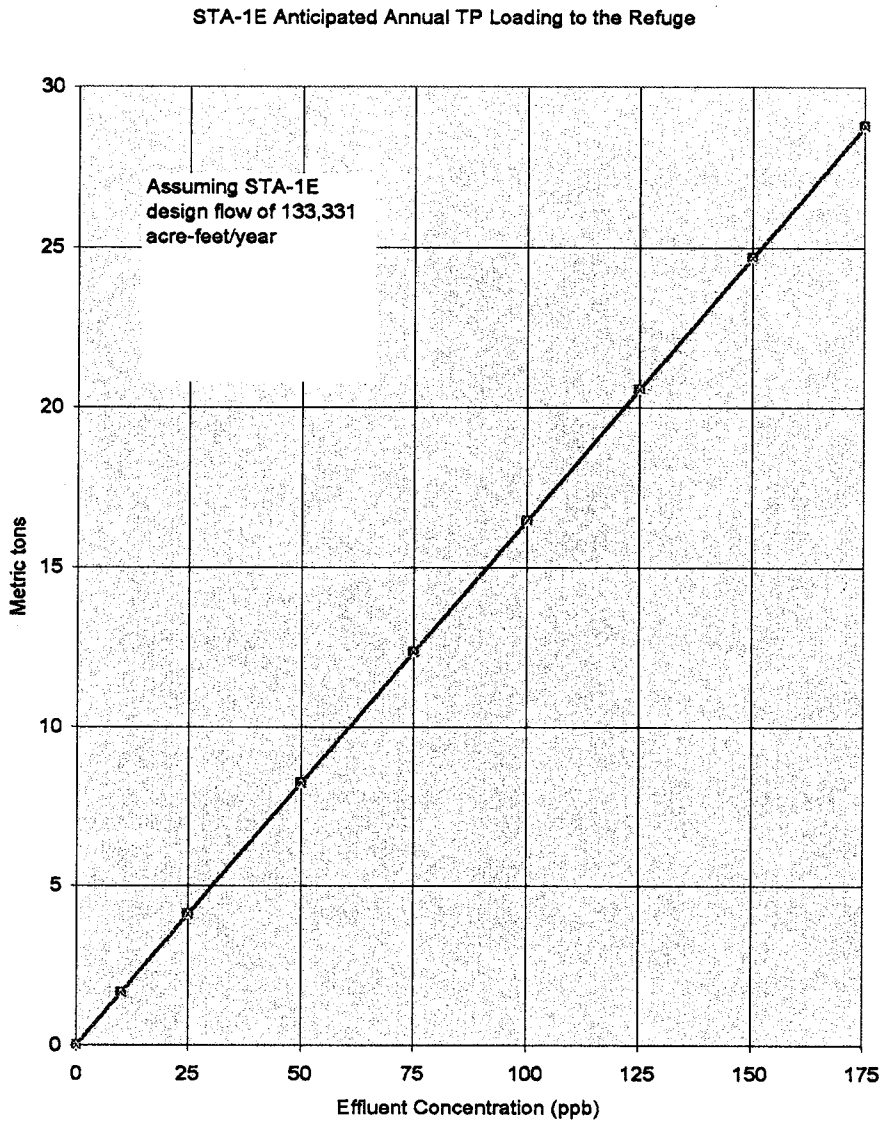

Figure 2. TP load at the proposed 50 ppb level results in over 8 metric tons/yr discharged into the Refuge. Approximately 6 metric tons of this will be new load not previously discharged to the EPA.

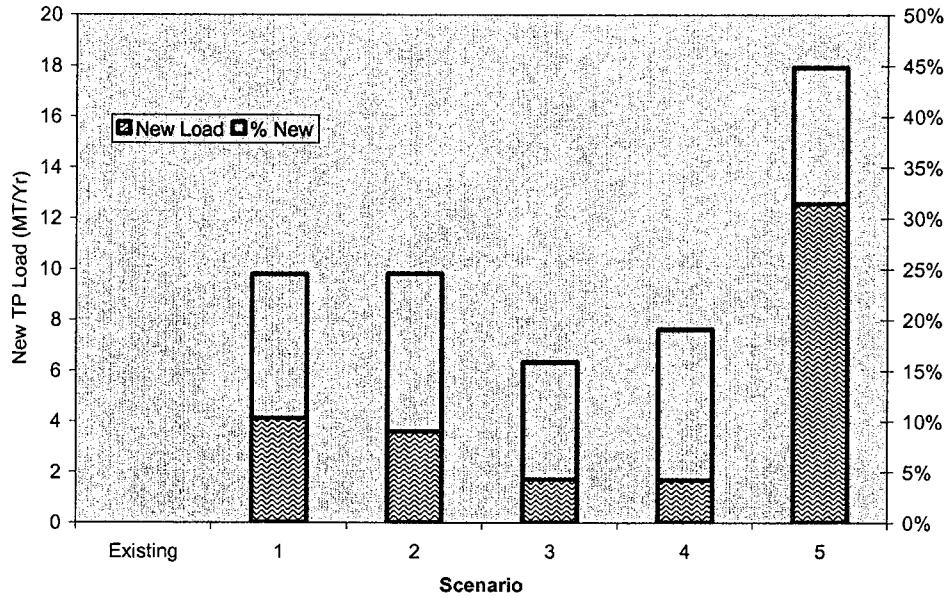

Figure 3. Total phosphorus load to the Refuge estimated to be associated with the new inflow water not previously entering the Refuge. Percent new is the percent of total load entering the Refuge that is associated with the new water.

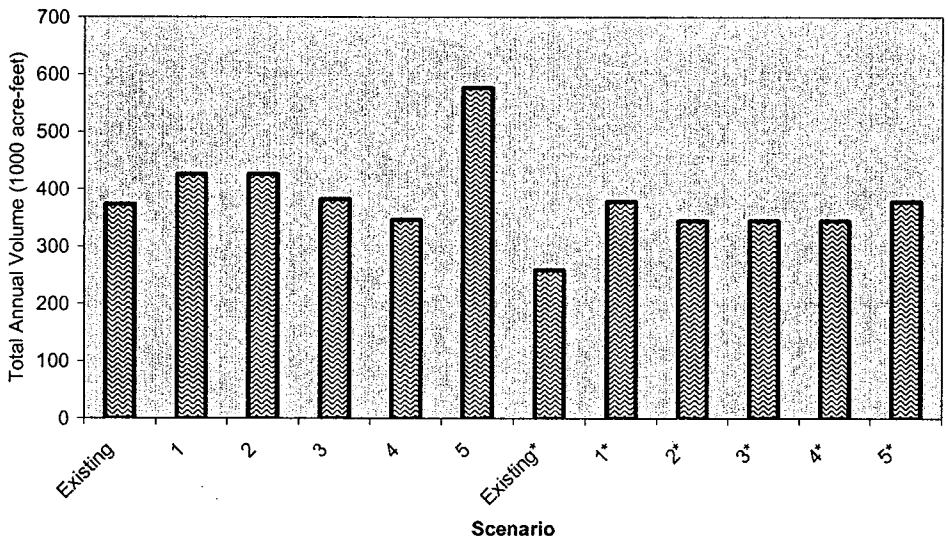

Figure 4. Total annual inflow volume to the Refuge under the extended set of alternatives.

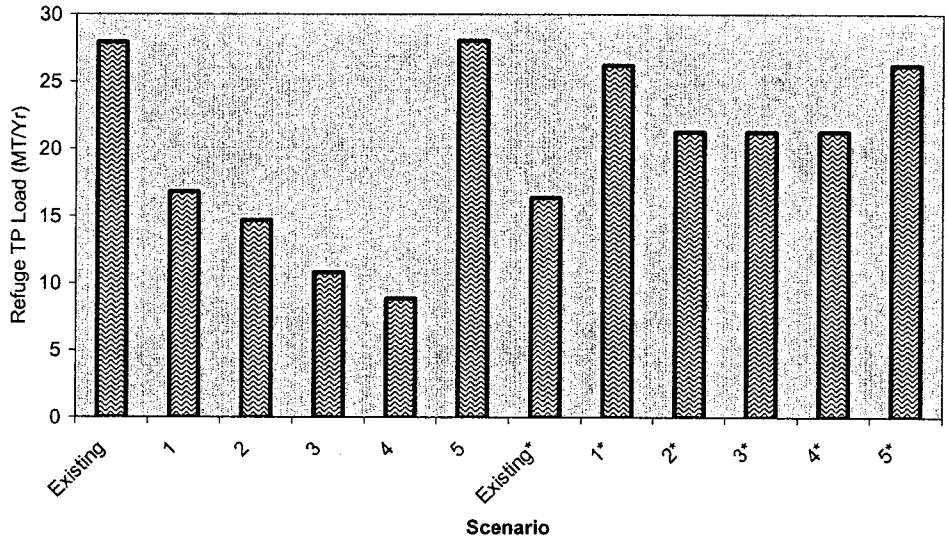

Figure 5. Total annual inflow TP load to the Refuge under the extended set of alternatives.